

THE ANNUAL PRODUCTION AND UTILIZATION OF DRY MATTER OF AN AVOCADO TREE

Gidon Adar

**Thesis submitted to the Faculty of Agriculture of the Hebrew University of Jerusalem for the Degree of Master Science in Agriculture
Rehovot, Israel 1998**

Abstract.

A quantitative analysis of the dry matter production and utilization of an avocado tree, during one annual cycle is presented in this work.

The daily assimilation rate of a "standard" avocado tree, with a canopy area of 50 m, was calculated. The calculation is based on photosynthetic measurements of Sharon & Bravdo (unpublished) on the south quadrant of a "Hass" avocado tree.

The calculated figures of the assimilation of the external layers of the canopy of an avocado tree are 0.89, 2.62, 0.89, and 0.78 mol CO₂ per day, for the east, south, west and north quadrants respectively. So, the assimilation of the external layers of the whole canopy area of an avocado tree in September is 5.18 mol CO₂ per day.

According to data on reduced light intensity which reaches leaves on the inner, shaded part of the tree, it was estimated that for the whole tree those leaves assimilate 1.9 mol CO₂ per day. So, the total assimilation of an avocado tree is 7.08 mol CO₂, which are 311.5 gram CO₂ per day.

The impact of each of the following factors on the monthly assimilation rate was estimated: leaf age, day length, yearly canopy growth, eastern dry winds stress (Sharav) and the climatic conditions during winter.

The monthly assimilation rate of a tree, calculated according to the order of the leaf flush and leaf age, has been defined as the assimilation potential. The assimilation potential figure has been adjusted according to day length, growth of the canopy between March and September and stresses caused by the "Sharav" and by winter conditions.

The compiled data show that the highest monthly assimilation rate occurs in August. During this month, a "standard tree" assimilates 216.2 mol CO₂, while in February; it assimilates only 35.6 mol CO₂, which is the lowest monthly assimilation during the year.

48.7 Kg of dry matter are added to all parts of the "standard avocado tree" during one year. This figure includes 18 Kg fruit per tree which corresponds to about 1.5 ton fresh fruit per dunam. 7 Kg of dry matter are added to the avocado tree during August. It is the maximal monthly addition of dry matter over the year, while in March, 1.9 Kg of dry matter are added to the tree, which is the minimal monthly addition. The maximal monthly dry matter accumulation in all the tree reservoirs, 3.4 Kg per tree, occurs in November.

The accumulation of all the energy comprising components in the avocado fruit, was calculated, while in parallel, the fruit's own carbohydrate production has been estimated. 9.7 Kcal per fruit are accumulated as dry matter during the first ten weeks of growth, while 76.8 Kcal per fruit are accumulated during the two weeks prior to maturity. In the first ten weeks of growth, the fruit's self assimilation provides about 21% of the accumulated energy. During the next growth period, the fruit's self assimilation provides only about 11% of the accumulated energy. This figure was calculated for a fruit 26 weeks after anthesis.

The "standard avocado tree" uses during one year, 2.6 Kg (5.4%) of dry matter for respiration, 18.1 Kg (37.2%) for the fruit, 24.1 Kg (49.6 %) for its growth and 3.8 Kg (7.8%) for the increase of its reservoirs.

According to a monthly comparison between the tree's dry matter production and its dry matter utilization, during winter and in April, the production exceeds the current use. During the period of May to October and in March, the tree's current dry matter production, does not supply all its dry matter needs.

The problems arising from the dry matter production and consumption during the annual cycle of an avocado tree are discussed in relation to flowering, fruit drop and agro-technical means which may increase the avocado yield.